A REVISION OF THE N.W. EUROPEAN SPECIES OF *MICROPLITIS* FÖRSTER (HYMENOPTERA: BRACONIDAE)

By G. E. J. Nixon

CONTENTS

SYNOPSIS

The North West European species of *Microplitis*, in so far as they have been available to me in the British Museum (Natural History), are revised. These number twenty-eight species, of which eight are introduced as new. Two further species are placed in synonymy.

ACKNOWLEDGEMENTS

My thanks are specially due to Mr A. W. Stelfox of Newcastle, Co. Down, N. Ireland for having lent me some years ago his collection of *Microplitis*, now the property of the U. S. National Museum. I wish to thank also the following gentlemen for the loan of material :—Dr Miroslav Capek of the Forest Research Institute, Banska Stiavnica, Czechoslovakia, Dr Max Fischer of the Naturhistorisches Museum, Vienna and Dr Wolter Hellén of the Helsinki Museum, Helsinki.

The genus ***MICROPLITIS*** Förster

In my revision of the Microgasterini I included *Microplitis* in my key to genera (1965 : 15) and made a brief reference to it on page 7. I made no attempt to split the genus into species-groups, though I remarked that this would need to be done eventually. I have not considered it either appropriate or practical to adopt such a course in this paper for the reason that the few species discussed, coming from a relatively small geographical region, do not cover the wide range of structure permitted by the generic definition of *Microplitis*.

Being based solely on material I have had before me, the paper contains no reference to published host-records, since it is rarely possible to be certain, from the literature, what species of *Microplitis* is being referred to.

Nothing, as far as I can discover, seems to be known about the complete annual life-cycle of the species occurring in N. W. Europe. Information is particularly needed not only about the range of hosts that the parasites may use at one time, but also what lepidoptera will be attacked when the next generation of parasites emerges.

Some species emerge when the host in which they have developed is no longer available at a suitable stage for parasitization. For example, *sordipes* leaves its winter cocoon in the spring, its hosts being acronyctid larvae parasitized the previous autumn. The cocoon, described in the text, is very characteristic in appearance. Now specimens of *Microplitis*, bred during the summer months from various hosts but spinning a cocoon quite different from that of *sordipes*, seem to be inseparable from this species. I am therefore suggesting that *sordipes* makes two kinds of cocoon, a tough, cryptic one in which to pass the winter and a simple one, thinner in texture and of generalized form, on emergence from its summer hosts. This view is supported by the available information.

I am not at all satisfied that I have been able to define clearly the limits of some of the species, for example, *viduus* and *ruricola*, *mediator* and *tuberculifera*. These two pairs of species are still in need of study. With few exceptions, among them *sispes*, *spinolae*, *xanthopus* and *ocellatae*, species of *Microplitis*, as far as my own experience allows me to judge, can be determined only by rather subtle combinations of characters.

In my companion paper on *Microgaster* (1968), I was able to announce that I had discovered several useful characters that could be used in the separation of species of that genus. *Microplitis* has proved more resistant and I have been able to find only one new character and this, I think, has no more than species-group value. This structure is referred to as a ' hair-line '; it is composed of a fine, raised line running longitudinally along the inner side of the hind femur, somewhat nearer to its dorsal than its ventral edge. Usually this raised line or ridge is beset along its whole length with a row of minute setae ; adjacent to it and parallel with it along its dorsal side are frequently two or three finer ridges. This structure is by no means always well defined. It seems to occur in the solitary species and is certainly absent in the majority of those species that I definitely know to be gregarious.

Key to Species

Females

1 First tergite distinctly, sometimes strongly, widened towards apex . . . 2

– First tergite not widened towards apex, parallel-sided or more often narrowed apically 7

2 Hind tarsus entirely reddish yellow ; hypopygium strongly developed and ovipositor freely projecting (Text-fig. 28).
Stigma bright orange-yellow on about basal third . ***xanthopus*** Ruthe (p. 28)

– Hind tarsus infuscate virtually throughout ; if not much darker than its tibia, then stigma dark throughout ; neither hypopygium strongly developed nor ovipositor freely projecting 3

3 Second tergite with at least some trace of rugosity, more distinct on lateral third . 5

– Second tergite polished and virtually smooth.
Scutellum polished and smooth at least over most of its medial surface . . 4

4 Flagellum slightly longer and thinner, dark throughout ; its preapical segment a little more than twice as long as wide ; lateral lobe of the mesoscutum polished and smooth right up to the anterior brow ; scutellum extensively and highly polished, strongly convex and with very few scattered hairs ; fore wing without a cloud beneath the stigma ; mesoscutum without trace of a medial keel
capeki sp. n. (p. 27)

– Flagellum slightly shorter and thicker, pale beneath ; its preapical segment only about one and one third times longer than wide ; lateral lobe of the mesoscutum dull because of fine surface sculpture ; mesoscutum almost always with a medial keel ; fore wing with a conspicuous cloud beneath the stigma ; scutellum less extensively polished, less convex and much more hairy . . ***sordipes*** Nees (p. 26)

5 Scrobes above becoming smooth, polished, the shining area reaching the level of the anterior ocellus ; 1st tergite about one and a half times longer than wide apically. Stigma bright orange-yellow on about basal third . . ***spinolae*** Nees (p. 27)

– Scrobes above dull, rugose, without this shining, polished space ; 1st tergite shorter, and usually more obviously widened apically 6

6 First tergite shorter, more conspicuously widened behind (Text-fig. 2) ; 2nd tergite much more obviously, sometimes strongly, rugose ; mesoscutum usually with keel ; tegula brown or blackish . . . . ***ratzeburgi*** Ruthe (p. 25)

– First tergite less widened behind (Text-fig. 5) ; 2nd tergite with much weaker rugosity, often hardly indicated ; mesoscutum with at most a faint line of raised rugosity ; tegula bright reddish yellow . . . ***fumipennis*** Ratzeburg (p. 25)

7 Antenna very short ; 1st segment of flagellum very distinctly less than twice as long as wide. Notaulices showing as deeply impressed, rugose furrows ; front femur short, swollen ; 1st tergite distinctly a little widened behind . ***heterocera*** Ruthe (p. 10)

– Antenna rarely as short as this and then the 1st segment of the flagellum is fully twice as long as wide and the notaulices are indicated at most by a band of dull rugosity 8

8 Ovipositor sheath very thin (Text-fig. 29), freely projecting beyond the apex of the gaster by a length equal to that of the 2nd segment of the hind tarsus ***sispes*** sp. n. (p. 15)

– Ovipositor sheath short, thicker, more or less concealed 9

9 First tergite subrectangular; if longer than wide, then not obviously narrowed apically ; if hardly longer than wide and a little constricted apically, then with a rather smooth, flattened appearance (*ocellatae*) ; in any case, never more than one and a half times longer than wide 10

– First tergite usually markedly narrowed apically and terminating in a polished knob ; at least twice as long as its middle width. Notaulices not impressed or conspicuous though frequently indicated by a band of coarse rugosity 22

10 Hind femur entirely or in greater part reddish or reddish yellow 11

– Hind femur varying from blackish to pale brownish yellow flushed with darker colouring along dorsal surface 17

11 Apical ventrite with a deep, apical emargination (Text-fig. 20). Sculpture of mesoscutum much reduced, the lateral lobes strongly shining and smooth-looking ; 1st tergite somewhat flattened and often reddened towards base ; tegula yellow . . . . . ***ocellatae*** Bouché (p. 13)

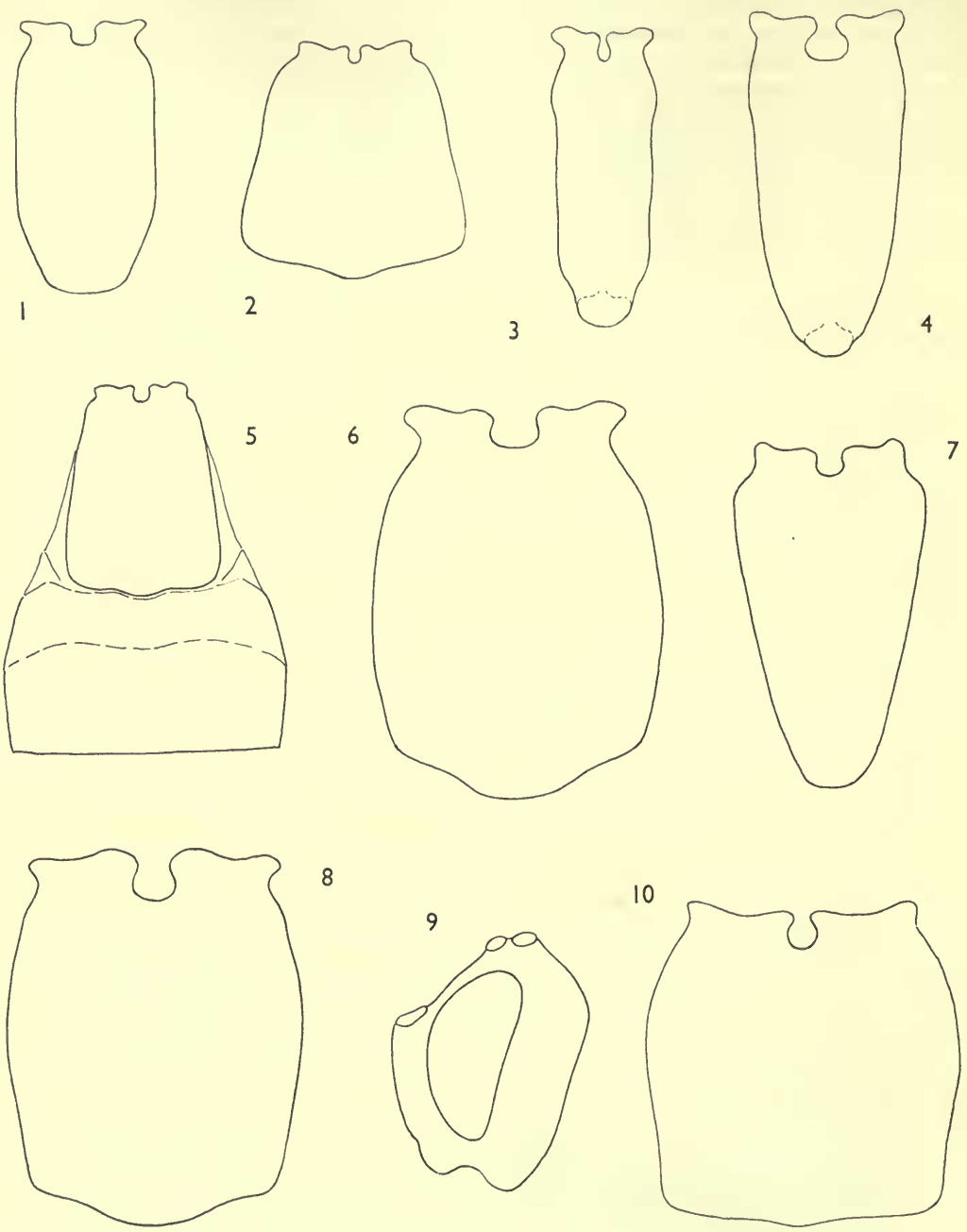
– Apical ventrite not emarginate. 12

12 Tegula reddish or reddish yellow 13

– Tegula blackish 15

13 Scutellum polished and almost unsculptured over its greater, medial part ; stigma somewhat short and wide (Text-fig. 22), its inner, proximal margin somewhat convex ; preapical segment of the flagellum hardly one and two thirds times longer than wide. . . . . ***sordipes*** Nees (p. 26)

– Scutellum dull, rugulose all over, even if weakly at middle ; stigma of usual shape, its inner, proximal margin hardly convex (Text-fig. 23) ; preapical segment of the flagellum fully twice as long as wide. Stigma entirely dark ; flagellum long, thin, tapering to apex. . . . 14



FIGS 1–10. *Microplitis*, ♀ : petiole of 1, *mandibularis* Thomson. 2, *ratzeburgi* Ruthe. 3, 4, *tuberculifera* Wesmael. 5, *fumipennis* Ratzeburg. 6, *idia* sp. n. 7, *sispes* sp. n. 8, *capeki* sp. n. 9, *capeki* sp. n., head (lateral). 10, *ocellatae* Bouché.

14 Fourth segment of the front tarsus hardly one and a half times longer than wide ; stigma less attenuated apically, the metacarp slightly shorter ; vannal lobe relatively smaller . . . . . ***strenuus*** Reinhard (p. 22)

– Fourth segment of the front tarsus about twice as long as wide ; stigma more attenuated apically, the metacarp somewhat longer ; vannal lobe relatively longer . . . . . ***eremita*** Reinhard (p. 22)

15 Scutellum very coarsely rugose-reticulate, appearing intensely black and glistening. Scape reddish, except at extreme apex ; stigma brown, rather short and wide, its external margin showing 4–6 black bristles ; preapical segment of the flagellum hardly less than twice as long as wide . . . . . ***docilis*** sp. n. (p. 28)

– Scutellum without such coarse sculpture, though still rugose all over . . . 16

16 Flagellum somewhat short and thick (Text-fig. 19), the preapical segment about one and a half times longer than wide ; hind femur often darkened in places ***viduus*** Ruthe (p. 23)

– Flagellum longer, thinner, not bristly, the preapical segment about twice as long as wide ; hind femur usually entirely red . . . . . ***ruricola*** Lyle (p. 24)

17 Flagellum long, thin, the preapical segment fully twice as long as wide ; stigma entirely dark 18

– Flagellum shorter, rather thick, the preapical segment not more than one and a half times longer than wide ; stigma usually conspicuously yellow basally . . 19

18 Hind femur without a hair-line ; scutellum shining and almost smooth ***idia*** sp. n. (p. 14)

– Hind femur with a hair-line ; scutellum dull, rugose all over . ***fordi*** sp. n. (p. 20)

19 Flagellum somewhat bristly (Text-fig. 19) ; large species, *c.* 3·5 mm. Hind femur with a more or less distinct hair-line. . ***viduus*** Ruthe (p. 23)

– Flagellum not at all bristly ; smaller species, not exceeding 3 mm . . . 20

20 Stigma conspicuously marked with yellow at base ; hind tibia more or less uniformly dull reddish, without trace of apical infuscation ; hind femur without a hair-line. Setae of the gaster somewhat inconspicuous, often restricted to a single row on the tergites ; gregarious spp. 21

– Stigma with at most the faintest trace of yellow at base ; hind tibia rather pale yellow with faint, apical infuscation ; hind femur with a distinct hair-line. Gaster conspicuously hairy . . . . . ***fordi*** sp. n. (p. 20)

21 Hind wing strongly embrowned, its basal vein deeply, almost angularly curved at middle (Text-fig. 12) ; front and middle femur markedly thickened ; inner spur of the hind tibia rather long. Scutellum almost polished. . . . . ***tristis*** Nees (p. 13)

– Hind wing not thus embrowned, its basal vein only weakly curved at middle (Text-fig. 11) ; front and middle femur not markedly thickened ; inner spur of the hind tibia shorter. Flagellum frequently pale at base . . . . ***spectabilis*** Haliday (p. 12)

22 Hind femur in greater part, or entirely, blackish or dark brown 23

– Hind femur in greater part, or entirely, reddish or yellowish 27

23 Mesoscutum with greatly reduced sculpture, posteriorly without an area of raised rugose-reticulation, the general surface decidedly shiny. Head distinctly widened behind the eyes ; antenna short 24

– Mesoscutum more strongly sculptured, posteriorly with a large area of raised rugose-reticulation that extends forwards along the course of the notaulices. First abscissa of the radius very obliquely placed on the stigma (Text-fig. 24) . 25

24 Flagellum very short, the preapical segment hardly one and one third times longer than wide ; femora short and thick, especially the front pair ; stigma yellowish on about basal third ; 1st abscissa of the radius very obliquely placed on the stigma ; vannal lobe small . . . . . ***aduncus*** Ruthe (p. 12)

– Flagellum longer, the preapical segment fully one and a half times longer than wide ; femora not unusually thickened ; stigma brown throughout ; 1st abscissa of the radius placed almost at right angles to the stigma ; vannal lobe considerably longer than in *aduncus*. . . . . ***naenia*** sp. n. (p. 14)

25 Basal third to two fifths of stigma bright yellow ; 1st tergite tending to be narrowed only at extreme apex.
Preapical segment of the flagellum nearly twice as long as wide ; inner side of the hind femur on apical half with narrow, longitudinal band of delicate aciculation ; hind tibia straw-yellow, without or with only very faint, apical infuscation ***sofron*** sp. n. (p. 21)

– Stigma dark virtually throughout ; 1st tergite gradually narrowed from base to apex 26

26 Preapical segment of the flagellum hardly longer than wide ; hind femur without band of aciculation in apical half on inner side ; 1st tergite polished and with only the most feeble indication of sculpture ; hind tibia reddish and becoming infuscate over fully apical third.
Second discoidal cell deep (Text-fig. 24) . . . . ***lugubris*** Ruthe (p. 16)

– Preapical segment of the flagellum fully twice as long as wide ; hind femur with a well marked band of fine aciculation in apical half on inner side ; apical, horizontal part of 1st tergite with strong rugosity ; hind tibia straw-yellow but becoming infuscate on about apical fifth . . . . . ***cebes*** sp. n. (p. 18)

27 All, or most, of basal half of flagellum yellow or reddish yellow and sharply contrasting with an entirely dark scape.
Spp. with tergite (2+3) yellow or reddish yellow. 28

– Flagellum entirely dark or if pale, then tergite (2+3) is entirely, or almost entirely, dark 29

28 Flagellum short, thick, the preapical segment not more than one and a half times longer than wide ; hypopygium small, inconspicuous ; 1st tergite narrow, fully twice as long as wide at middle, almost parallel-sided, dull and quite strongly rugose ; anal vein of hind wing reaching distinctly beyond the middle of the vannal lobe (Text-fig. 15) . . . . . ***trochanterata*** Thomson (p. 19)

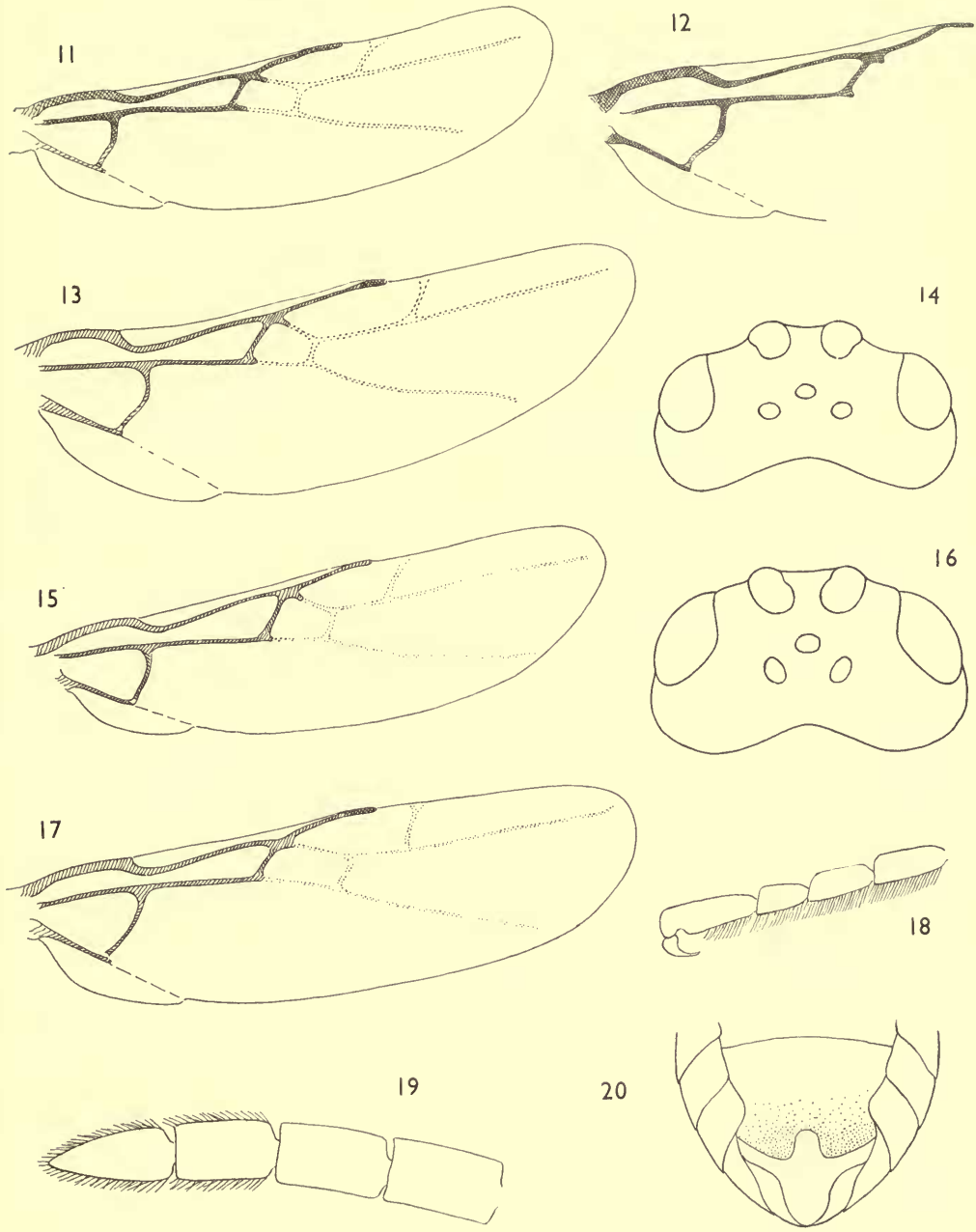
– Flagellum longer, the preapical segment twice as long as wide ; hypopygium very large and strongly produced (Text-fig. 26) ; 1st tergite broader and a little shorter than in *trochanterata* ; more obviously narrowed apically, less rugose and frequently in part reddened ; anal vein of the hind wing not distinctly reaching beyond the middle of the vannal lobe (Text-fig. 17) . . . ***calcarata*** Thomson (p. 19)

29 Flagellum pale on fully basal half ; 1st tergite almost parallel-sided.
Flagellum somewhat short, the preapical segment about one and a half times longer than wide ; hind tarsus virtually as yellow as its tibia ***mandibularis*** Thomson (p. 15)

– Flagellum virtually blackish throughout, sometimes slightly pale beneath in *tuberculifera*.
Spp. with 1st tergite always much longer than wide, strongly tapered apically and ending in a polished knob 30

30 Antenna very distinctly shorter than the body, its preapical segment hardly one and a half times longer than wide ; sculpture of the mesoscutum reduced, the lateral lobes shining and almost polished . . . . ***naenia*** sp. n. (p. 14)

– Antenna about as long as the body, the preapical segment hardly less than twice as long as wide ; sculpture of the mesoscutum not reduced, the lateral lobes dull and with fine rugosity everywhere 31



FIGS 11–20. *Microplitis*, ♀ : hind wing of 11, *spectabilis* Haliday. 12, *tristis* Nees. 13, *sispes* sp. n. 14, *sispes* sp. n., head (dorsal). 15, *trochanterata* Thomson, hind wing. 16, *idia* sp. n., head (dorsal). 17, *calcarata* Thomson, hind wing. 18, *tuberculifera* Wesmael, ♂, front tarsus. 19, *viduus* Ruthe, ♀, apical flagellar segments. 20, *ocellatae* Bouché, ♀, apex of gaster (ventral).

31 First tergite very narrow, about three times as long as its middle width ; pubescence of flagellum slightly longer, the sparse, erect bristles at middle and apex of segments slightly longer and more conspicuous ; pale parts of the legs almost straw-yellow ; hind tibia usually with well defined infuscation at extreme apex ; ♂ with long, dense pubescence beneath front tarsus (Text-fig. 18)

tuberculifera Wesmael (p. 17)

– First tergite less narrow, about twice as long as wide and ending in a much less conspicuous knob ; pubescence of flagellum slightly shorter, the erect bristles less noticeable ; pale parts of the legs more deeply yellow ; hind tibia usually without apical infuscation ; ♂ without such pubescence beneath front tarsus

mediator Haliday (p. 18)

Microplitis heterocera (Ruthe)

Microgaster heterocera Ruthe, 1860 : 135.

♀. Fore wing strongly darkened on proximal half ; a very dark cloud beneath the stigma ; stigma dark brown, with only the faintest indication of a pale basal spot ; basal quarter of hind wing hyaline.

Head strongly transverse and clearly widened behind the eyes ; the surface between the ocelli and the eyes very shiny, only weakly rugose. Flagellum very short, much thickened basally ; 1st flagellar segment distinctly less than twice as long as wide ; preapical segment about one and one third times longer than wide.

Lobes of mesoscutum polished and almost unsculptured ; notaulices deep, flowing behind into an area of striate rugosity. Scutellum highly polished, with a few weak punctures laterally. Legs short, thick, the front femur strongly swollen ; inner spur of the hind tibia reaching slightly beyond the middle of the hind basitarsus. Metacarp unusually short, distinctly shorter than its distance from the apex of the radial cell ; stigma broad ; 2nd discoidal cell rather short and wide ; vannal lobe rather large.

Gaster appearing very shiny, owing to sparseness and shortness of hairs ; 2nd suture straight and defining tergite 2 which is short and without pale areas anterolaterally.

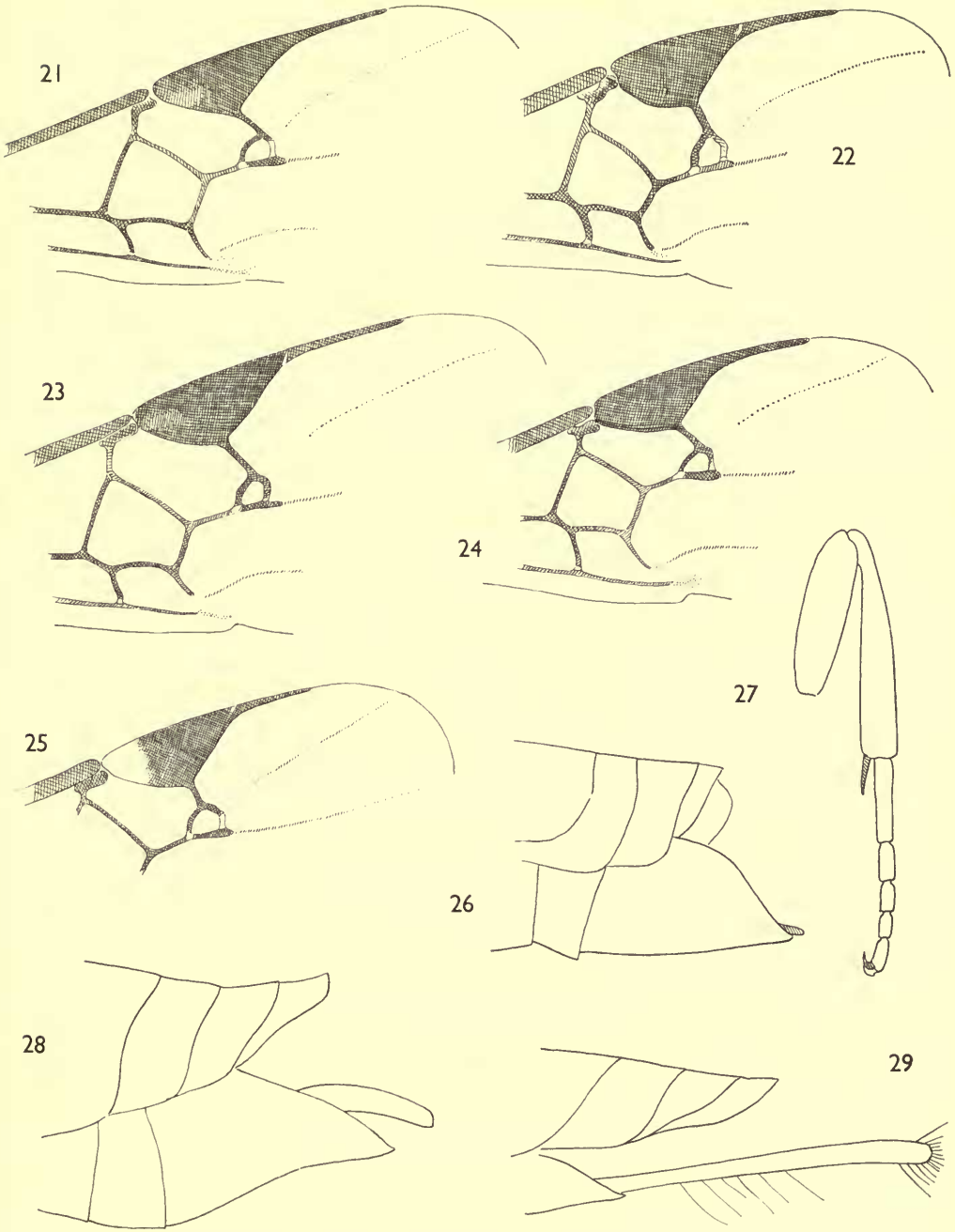
Length : *c.* 3·3 mm.

The above notes are based on the single female bred in Czechoslovakia by Capek. The type, which is in the BMNH, has the gaster and hind legs missing and scutellum and posterior part of the mesoscutum destroyed by a pin. In this female, the front femur is entirely pale ; the pale parts of the legs are paler than those of the female bred by Capek but this may be due to fading for the type is more than one hundred years old.

Material examined. GERMANY : Berlin, Type ♀ in BMNH (Ruthe Coll.). CZECHOSLOVAKIA ; Sturovo, 1 ♀, bred 20.v.1964 from *Dicycla oo* Linn. (*M. Capek*).

Host : *Dicycla oo* Linn. (Noctuidae). Cocoon greyish-white, without ribbing.

I have examined two males, old and faded and labelled ' Conchylis zebrana. O. Hofman ' from the Naturhistorisches Museum, Vienna, that I am confident belong to this species. One specimen has the first tergite slightly widened to apex, the other more so ; in both specimens, this tergite is broadly polished and smooth along middle and across apex ; the hind tibiae are dirty yellow and the hind tarsi almost as pale. I am labelling these two specimens as ' heterocera Ruthe '.



FIGS 21–29. *Microplitis*, ♀ : fore wing of 21, *cebes* sp. n. 22, *sordipes* Nees. 23, *eremita* Reinhard. 24, *lugubris* Ruthe. 25, *spectabilis* Haliday. 26, *calcarata* Thomson. 27, *aduncus* Ruthe, ♀, hind leg. 28, *xanthopus* Ruthe, ♀, apex of gaster (lateral). 29, *sispes* sp. n., ♀, ovipositor sheath (lateral).

Microplitis spectabilis (Haliday)
(Text figs. 11, 25)

Microgaster spectabilis Haliday, 1834 : 236.
Microplitis spectabilis (Haliday) Reinhard, 1880 : 359.
Microgaster parvulus Ruthe, 1860 : 139. [Syn. Reinhard, 1880 : 359].

♀. Tegula yellow. Wings often almost uniformly hyaline ; if the fore wing shows faint infuscation, then it is still strikingly paler than that of the related *tristis*.

Head, seen from above, rather deep from back to front ; its upper surface evenly and, for the size of the insect, rather strongly rugose. Flagellum rather thick, somewhat smooth-looking towards apex ; preapical segment from one and one third to one and a half times longer than wide.

Mesoscutum more strongly sculptured than in *aduncus*, a species of similar size ; its sculpture neither weak nor strong and hence not at all characteristic. Scutellum becoming strongly shining over most of its median surface and only vaguely sculptured. Stigma decidedly broad ; abscissa 1 of the radius never longer than the transverse cubitus, usually distinctly shorter ; vannal lobe small (Text-fig. 11). Hind tibia, seen from the side, a little dilated before apex ; hind femur without trace of a hair-line.

♂. Flagellum apparently always at least slightly paler beneath.

Length : 2·6–2·8 mm.

Material examined. GERMANY : Berlin district (Ruthe coll. in BMNH). ENGLAND : Kent, Bexley, long series bred 17.v.1961 from Noctuid larva found ix.1960 (*R. L. E. Ford*) ; Gravesend, series bred v.1938 from larva of *Meristis trigrammica*, found viii.1937 (*R. L. E. Ford*). Hants, New Forest, series bred from *Dyschorista fissipuncta* (Lyle coll. in BMNH). MOROCCO : Gt. Atlas Mts., 1 ♂ ; this male has the hind femur entirely yellow.

Host : *Dyschorista fissipuncta* Haworth, now *Enargia ypsilon* Denis & Schiffermüller ; *Meristis trigrammica* Hufnagel, now *Charanyca trigrammica* Hufnagel.

A gregarious parasite, spinning a loose heap of brown, unribbed cocoons.

This species is largely characterized by the broad, bicoloured stigma and the general appearance of the 1st tergite. Another feature of some assistance in identification is the dull, reddish or dingy yellow hind tibia with its complete absence of apical infuscation. The male differs from that of *aduncus* in not having the head widened behind the eyes.

Microplitis aduncus Ruthe
(Text-fig. 27)

Microgaster aduncus Ruthe, 1860 : 129.
Microplitis aduncus (Ruthe) Reinhard, 1880 : 359.

♂ ♀. A dark-legged species ; hind femur dark brown ; all tibiae yellowish brown ; the hind tibiae almost as brown as their femora in one male (Arolla). Stigma weakly yellowish on basal quarter to basal third.

♀. Head conspicuously widened behind the eyes. Antenna very short, with segments 14–17 only very slightly longer than wide ; flagellum not noticeably thickened basally, its 1st segment fully twice as long as wide.

Mesoscutum shiny, its sculpture much reduced ; the surface (for the genus) smooth-looking but duller along the course of the notaulices and behind. Scutellum almost polished but with some weak punctation. Radius very obliquely placed on the stigma. Legs short, thick,

especially the front femur ; hind femur without trace of a hair-line or fine, parallel aciculation ; inner spur of the hind tibia almost reaching to middle of hind basitarsus (Text-fig. 27).

Vannal lobe small, narrow.

Tergite 1 almost smooth, distinctly narrowed behind. Gaster otherwise having an evenly convex, highly polished appearance ; its setae short, inconspicuous compared with the majority of the species.

♂. Differs from that of *spectabilis* in having the head markedly widened behind the eyes.

Length : ♂ ♀, *c.* 2·8 mm.

Material examined. FINLAND : Jomala, 1 ♀ (*W. Hellén*). SWEDEN ; Skåne, 1 ♀ (*D. M. S. & J. F. Perkins*). SWITZERLAND : Arolla, 1 ♀, 1 ♂ (*R. B. Benson*). Type in the BMNH.

Like *spectabilis*, this species has the hind tibia uniformly dull brownish red. The two species are probably closely related and are most readily separated on the thickness of the front femur, the shape of the head and the shorter hind tarsus of *aduncus* with its relatively longer tibial spur.

In many respects *aduncus* is transitional between the more generalized *spectabilis* and the extreme *heterocera*.

Microplitis tristis Nees

(Text-fig. 12)

Microgaster tristis Nees, 1834 : 168.
Microplitis tristis (Nees) Reinhard, 1880 : 359.
Microplitis dolens Marshall, 1885 : 232. [Syn. Telenga, 1955 : 164.]

♀. Wings strongly embrowned, darker than in any other species but with conspicuous, yellow patch at base of stigma. Hind tibia uniformly dull reddish.

Scutellum strongly shining and almost smooth over its greater, medial part.

Setae of the gaster comparatively short and sparse. First tergite sometimes slightly widened apically, its sculpture weak, the general surface smooth-looking and shiny.

EUROPE. Probably common.

Host : *Hadena cucubali* Fuessly ; *Hadena capsincola* Hübner (now synonym of *H. bicruris* Hufnagel). Material from both these noctuid hosts in BMNH. I have seen series belonging to the Naturhistorisches Museum, Vienna, labelled as bred from *Plusia moneta* Fabr.; and *Plusia consona* Fabr. (Reinhard Coll.) (Noctuidae). A gregarious parasite, making greyish brown cocoons, without longitudinal ribs.

This species is characterized essentially by the brown wings and curved basal vein of the hind wing.

Microplitis ocellatae (Bouché)

(Text-figs 10, 20)

Microgaster ocellatae Bouché, 1834 : 161.
Microplitis ocellatae (Bouché) Reinhard, 1880 : 358.

This species is rather easily recognized by the deeply emarginate apex of the apical ventrite of the female (Text-fig. 20). The short, broad, very smooth-looking first tergite is also characteristic (Text-fig. 10).

N. W. Europe. Japan (two examples in BMNH bred from *Smerinthus planus* Walker, det. Watanabe).

Host : Sphingidae. *Smerinthus ocellatus* L., *Smerinthus planus* Walker ; *Laothoe populi* L., *Mimas tiliae* L. A gregarious parasite ; the numerous, dark, greyish brown cocoons, unribbed, are loosely heaped together around the body of the host-caterpillar.

Microplitis idia sp. n.

(Text-figs 6, 16)

♀. Wings faintly darkened ; stigma evenly brown ; tegula dark brown. Front and middle tarsus yellow.

Head strongly transverse and clearly a little widened behind the eyes (Text-fig. 16). Clypeus flattened, rather shiny. Maxillary palpus rather long, the distal four segments together as long as the front tarsus.

Sculpture of the mesoscutum on the whole very fine, except for the roughened, notaulic bands. Areolet of the fore wing very obviously four-sided.

Tergite 1 about one and one third times longer than wide, flattened, very feebly sculptured and shiny ; very slightly narrowed apically but this hardly detracts from its essentially rectangular appearance (Text-fig. 6). Hypopygium without trace of an apical emargination.

Length : *c.* 4 mm.

Type ♀. Sweden : Skåne, Skäralid, 3.vii.1938 (*D. M. S. & J. F. Perkins*), BMNH.

This species is chiefly characterized by its reduced sculpture and long, thin flagellum. Probably closely related to *ocellatae*, from which it differs at once in shape of hypopygium. Like *ocellatae*, it may turn out to be a gregarious parasite.

Microplitis naenia sp. n.

♀. Wings virtually hyaline ; stigma with only a very weakly indicated basal spot ; tegula yellow or at least pale. Hind femur black in two out of four females (including the type) but yellow with basal infuscation in two others ; hind tibia infuscate almost throughout in type but with pale, basal ring ; in remaining females the hind tibia is yellow with extreme apical infuscation, more noticeable above.

Head distinctly widened behind the eyes.

Mesoscutum shiny, very weakly rugose for the genus ; notaulic courses indicated as dull, finely rugose bands ; these bands flow into a posterior area of fine rugosity in which there are traces of weak longitudinal striation (three females, Czechoslovakia). Scutellum flattened, shiny, a little less polished than in *aduncus* and with fine, superficial punctation. Sculpture of propodeum less coarse than in *aduncus*. Metacarp slightly longer than its distance from the apex of the radial cell and distinctly longer than the interior, distal margin of the stigma. Inner side of the hind femur without a hair-line. Mesosternal suture very narrow, hardly or only very weakly foveate. Mesopleural furrow long, narrow, sharply discrete.

First tergite about twice as long as wide, markedly narrowed apically, its sculpture on the whole very fine and tending to fade out altogether on the apical, turned over part of the segment ; rest of gaster highly polished, with very inconspicuous setae ; tergite (2+3) with a feebly indicated, raised median field ; 2nd suture very weakly indicated but markedly bisinuate.

Length : *c.* 3·2 mm.

Type ♀. England : Gloucester, High Meadow Woods, 4.vi.1936 (*E. B. Britton & J. F. Perkins*), BMNH.

Paratypes. CZECHOSLOVAKIA : Sturovo, 2 ♀, 5.v.1962, ex *Taeniocampa pulverulenta* (*M. Capek*) ; Banska Stiavnica, 1 ♀, 1954—4.v.1955, ex *Scopelosoma satellitium* (*M. Capek*), Kalvaria, 1 ♀, 20.v.1959, ex *Scopelosoma satellitium* (*M. Capek*) ; 1 ♀, labelled ' Tschek. 1872 ' in Naturhistorisches Museum, Vienna.

Host : *Taeniocampa pulverulenta* Esper (now *Orthosia cruda* Schiffermüller) ; *Scopelosoma* (now *Eupsilia*) *satellitia* L. (*Noctuidae*). Cocoon brown with conspicuous white ribs, solitary.

Although this species could be confused with *aduncus* because of the shape of the head and the short antenna, it is, on the other hand, probably fairly closely related to *idia*, having like that species a relatively large vannal lobe and greatly reduced thoracic sculpture. It differs from *idia* on antennal structure and the shape of the first tergite.

Microplitis mandibularis Thomson

(Text-fig. 1)

Microplitis mandibularis Thomson, 1895 : 2251.

♂ ♀. At least the basal third of the stigma very pale yellow. Legs, excluding the hind coxae, entirely pale yellow.

♀. Sometimes tergite (2+3) is much marked with yellow ; such females can easily be confused with those of *mediator* ; but in *mediator* the hind tarsus is always strongly infuscated, the flagellum is always blackened and tergite 1 is more strongly narrowed behind.

Inner side of the hind femur with a very weakly defined hair-line, the whole of the femoral area ventral to the line tending to be smooth and highly polished.

Tergite 1 is almost parallel-sided (Text-fig. 1), smooth-looking, except at apex, its sculpture very weak.

♂. Flagellum pale throughout though this is sometimes more obvious on the underside. This character alone will separate the species from *tuberculifera*. Front tarsus densely fringed beneath with pale pubescence, similar to that which occurs in the males of *tuberculifera* ; this pubescence is more easily seen and appreciated in larger males.

Length : ♂ ♀, 2·4–3·2 mm. Very variable in size.

Common and widely distributed in N. W. Europe.

Host : A gregarious parasite of *Jodio croceago* Fabr. (pupated 28.vi ; emerged 7.vii) ; *Lampra fimbriata* Schreber (pupated 26.iii ; emerged 17.iv) ; (Noctuidae) ; both series from S.E. ENGLAND in BMNH.

My interpretation of this species is based on an examination of the type-series in Lund in 1948.

Microplitis sispes sp. n.

(Text-figs 7, 13, 29)

♀. Black ; tergite (2+3) with paler, antero-lateral areas. Wings entirely hyaline ; stigma dark brown throughout. Hind femur and hind tibia entirely reddish yellow in paratype ; in holotype, the hind femur shows extremely faint infuscation at extreme base.

Head very strongly characteristically transverse, a little widened behind the eyes (Text-fig. 14). Surface of frons and vertex somewhat shining, their sculpture fine for the genus. Antenna long, thin ; preapical segment of flagellum twice as long as wide (holotype), broken in paratype ; pubescence of flagellum extremely fine and not in the least upstanding. Ocelli in a low triangle, the posterior tangent to the anterior ocellus touching the posterior pair.

Sculpture of the thorax greatly reduced, the general surface very smooth-looking compared with the other species dealt with in this paper. Mesoscutum finely rugose, faintly shining ; notaulices showing as narrow, dull bands of rugosity, that posteriorly flow into a large area of similar rugosity ; this posterior area is dull but without the raised rugosities found in most other species. Scutellum shining, smooth, weakly punctate. Mesopleurum with a narrow sharply defined sternaulus ; the surface below the furrow strongly shining and weakly punctate. Mesosternum rugulose, the medial suture very narrow, not obviously foveate. Wings rather large ; hind wing with relatively large vannal lobe (Text-fig. 13).

Tergite 1 twice as long as its basal width, gradually narrowed to apex (Text-fig. 7), weakly rugose mostly along sides and ending apically in a polished knob. Ovipositor sheath very narrow, about as long as the hind basitarsus and projecting beyond the apex of the gaster by a length equal to the 2nd segment of the hind tarsus (Text-fig. 29).

Length : ♀, 4 mm., without ovipositor sheath.

Type ♀. GERMANY : Hanover, 22.v.1943, ex *Taeniocampa stabilis* (*R. Hinz*), BMNH.

Paratypes. 1 ♀, same data as above but 1953. CZECHOSLOVAKIA : Sikenica, 1 ♀, 2.v.1966 ex *Taeniocampa stabilis* (*M. Capek*).

Host : *Taeniocampa stabilis* Vieweg (Noctuidae). Cocoon brown, tough, with strong, even, longitudinal ribs.

Easily distinguished from all the other species in this paper by the narrow, strongly exserted ovipositor sheath. In general reduction of sculpture, *sispes* resembles *idia* but the shape of the 1st tergite is different and the clypeus is not at all flattened.

Microplitis lugubris (Ruthe)

(Text-fig. 24)

Microgaster lugubris Ruthe, 1860 : 135.
Microplitis lugubris (Ruthe) Reinhard, 1880 : 359.
Microplitis borealis Marshall, 1885 : 237, **syn. n.**

♀. A very dark species. Palpi blackish. Fore wing markedly and uniformly smoky ; stigma dark brown throughout. Middle and hind femora blackish ; hind tibia becoming gradually infuscate distal to middle, more especially on external side; otherwise reddish brown.

Antenna rather short, with the three preapical segments varying from almost square in outline to about one and one quarter times longer than wide.

Mesoscutum finely rugose ; notaulices showing as slightly rougher, rugulose bands but not impressed ; posterior part of mesoscutum finely, intricately rugose-reticulate. Scutellum strongly shining and with a variable amount of punctation. Metacarp very slightly shorter than its distance from the apex of the radial cell (Text-fig. 24).

Tergite 1 strongly, evenly narrowed to apex, polished, almost smooth. Gaster having a very shining appearance owing to hairs being short and reduced almost to a single row on each segment ; the ill-defined tergite 2 with a blister-like swelling medially and with a pale, semicircular membranous area at each antero-lateral corner. Hypopygium large and in dead specimens, at any rate, projecting slightly beyond the apex of the gaster.

♂. Like the female except for the sexual differences.

Length : ♂ ♀. ca. 3·2 mm.

N. W. EUROPE. Widely distributed.

In a series of 13 males (SWITZERLAND : Valais and Engadine), the sculpture of the scutellum is very variable, some specimens having it finely rugose all over with

gradations between this condition and the shiny, predominantly punctate surface found in the scutellum of the female.

All specimens that I have identified as this species were taken in June.

Characterized in both sexes by the position of the radius where it leaves the stigma and the shape and polished surface of the 1st tergite. The short antenna of the female helps to make this sex particularly easy to identify.

The types of both *lugubris* and *borealis* are in the BMNH.

Microplitis tuberculifera (Wesmael)

(Text-figs 3, 4, 18)

Microgaster tuberculifera Wesmael, 1837 : 43.
Microplitis tuberculifera (Wesmael) Reinhard, 1880 : 359.

Females of this species are easily confused with those of *mediator*. That the two species are distinct is amply shown by the pubescence of the underside of the front tarsus of the male ; in the male of *tuberculifera*, the underside of the front tarsus is densely fringed with white silky pubescence (Text-fig. 18).

In addition to the characters given in the key, *tuberculifera* may be compared with *mediator* as follows :—

♀. More brightly coloured. Front and middle coxae usually entirely yellow and the hind coxa is frequently splashed with yellow beneath ; in *mediator*, the hind coxa is always blackish and the two front pairs are infuscated.

Sculpture of posterior part of mesoscutum reduced, the surface being often predominantly granulate ; in *mediator*, the posterior part of the mesoscutum shows raised rugose-reticulation. The thoracic pubescence of *tuberculifera* is more conspicuous, more silky and paler (almost whitish) than in *mediator*.

Tergite 1 considerably longer and narrower than in *mediator*, but evidently very variable in shape (Text-figs 3, 4).

Length : 3·6 mm.

N. W. Europe. Common and widespread.

Host : Solitary parasite of various Noctuidae. *Plusia chrysitis* L., *Phalaena typica* L., *Taeniocampa stabilis* Vieweg. Cocoon similar to that of *mediator*.

A series of sixteen females from various localities in Skåne, Sweden are smaller in size than females from the British Isles with relatively larger head and narrower petiole. I was at first inclined to regard these and a corresponding series of males as a species distinct from *tuberculifera*. Nevertheless, I have several females from Skåne that seem to be intermediate between the extreme Swedish series and the rest and in consequence I prefer to regard the whole of the material as belonging to one species, or species-aggregate, characterized in the male by the pubescence on the underside of the front tarsus.

Microplitis mediator (Haliday)

Microgaster mediator Haliday, 1834 : 235.
Microplitis mediator (Haliday) Reinhard, 1880 : 359.
Microgaster medianus Ruthe, 1860 : 127. **Syn. n.**
Microplitis medianus (Ruthe) Reinhard, 1880 : 359.

The difficulty of finding a combination of characters for separating the female of this species from that of *tuberculifera* has already been discussed under the latter species. Most of the differences have been given in the key ; there is little to add.

♀. Slightly smaller and more compact in build. Although generally a darker insect, this species tends to be more brightly coloured than *tuberculifera* ; sometimes tergite (2+3) is entirely reddish yellow but I am unable to relate this either to locality or any other factor. Females with pale marked gaster could be confused with *mandibularis* but in this species the segments of the flagellum are shorter.

The mesosternal suture is deeper and more obviously costate in this species than in *tuberculifera* ; this applies also to the males. The mesoscutum of *mediator* posteriorly shows a strong tendency to develop raised reticulate rugosities.

♂. Distinguished from that of *tuberculifera* by the absence of erect silky pubescence on the underside of the front tarsus.

Widespread and common in N.W. Europe.

Host : *Orthosia miniosa* Fabr., *Phalaena typica* L., *Amathes xanthographa* Fabr., *Cucullia verbasci* L., (Noctuidae).

A solitary species, making a greenish grey or brownish grey, feebly ribbed cocoon.

In spite of all I have said above and even with the abundance of material that I have had at my disposal, I cannot claim to have defined clearly the limits of this species and *tuberculifera*.

Microplitis cebes sp. n.

(Text-fig. 21)

♀. Palpi dark throughout. Tegula dark brown. Wings more or less hyaline and without darker patches ; stigma with faint, pale, basal spot. Hind femur black or blackish (decidedly black in holotype) ; hind tibia somewhat pale yellow but infuscate in about apical fifth.

Antenna markedly long, somewhat tapered distally ; the preapical segment fully twice as long as wide. Sculpture of vertex and temples somewhat coarse in comparison with the related *tuberculifera*.

Notaulices defined by bands of coarse reticulation and posteriorly flowing into a large area of somewhat wide-meshed reticulation ; in this respect, the species differs from the *tuberculifera-mediator* complex in which the mesoscutal sculpture tends to be much more even, without or with hardly emphasized notaulic bands. Scutellar shield a little smoother and a little more shiny medially. Mesopleural furrow sharply delimited throughout. Wings : 1st abscissa of the discoideus distinctly a little less than half as long as the 2nd (Text-fig. 21) ; metacarp as long as or slightly longer than its distance from the apex of the radial cell ; vannal lobe relatively larger than in *tuberculifera* and distally less obviously wedge-shaped. Hind femur on its inner side with fine hair-line in apical half, bordered above by narrow band of extremely fine aciculation.

Tergite 1 more or less evenly narrowed to apex and with conspicuous, apical, polished knob.

♂. Like the female, except that the hind femur may in part become suffused with paler colouring (1 ♂, Volosca). The underside of the anterior tarsus shows the normal short pubescence of the genus (but cf. *tuberculifera*).

Length : ♂ ♀, 3·8–4·0 mm, larger than *tuberculifera*.

Type ♀. SWITZERLAND : Valais, near Verbier, 5000–6000 ft, 25–28.vi.1959 (*J. E. & R. B. Benson*), BMNH.

Further material, paratypes. AUSTRIA : Lunz, 1 ♀ ; S. Tyrol, Radein, 1 ♀, both in Naturhistorisches Museum, Vienna. JUGOSLAVIA : Istria, Volosca, v., 1 ♂, 1 ♀, in Nat. Mus. Vienna. CZECHOSLOVAKIA : Tatranska Polianska, Tatra Mts, 28.v.1932, 1 ♂, in BMNH. SWITZERLAND : Valais, Les Haudières, 4800 ft, 7.vi.1935, 1 ♂ in BMNH.

I am confident that *cebes* is a good species. What characterizes it is not easily put into words, though size, long flagellum of female, shape of first tergite and especially the shortness of the 1st abscissa of the discoideus all play a part. In general facies, the species is like *tuberculifera* and *mediator* but in having stronger mesoscutal sculpture approaches the *viduus-ruricola* complex. It is noteworthy that all the material available is from mountainous regions in Central Europe.

Microplitis trochanterata Thomson
(Text-fig. 15)

Microplitis trochanterata Thomson, 1895 : 2249.

♂ ♀. This species is essentially characterized in both sexes by the narrow, parallel-sided, strongly rugose petiole ; the rugosity of the petiole has a characteristic evenness. The unusually small vannal lobe of the hind wing is also a feature (Text-fig. 15) ; the anal vein reaches very distinctly beyond the middle of the vannal lobe.

In 25 Swedish males examined, the hind femur, with two exceptions in which it is flushed with red along sides, is entirely dark brown ; the middle femur is usually sharply darkened on about basal half. Palpi infuscate, never yellow as in *mediator*.

Unlike *calcarata*, the mesoscutum along the course of the notaulices and within a large, posterior area, shows an intricate rugose-reticulation ; the granulate sculpture, so much a feature of *calcarata*, is absent in *trochanterata*.

The general appearance of the petiole is remarkably constant in all specimens examined, of both sexes.

♀. Striking on account of the appearance of the antenna ; the flagellum is thick, rather short, the first 8–9 segments bright yellowish ; the preapical segment is about one and one third times longer than wide ; scape dark brown. Hind femur with more or less distinct hair-line, bordered anteriorly by 2–3 delicate striations.

SWEDEN : various localities in Skåne, 25 ♂, 3 ♀. ENGLAND : Hants, Stockbridge, 1 ♂ ; Cornwall, Botusfleming, 1 ♂ ; Herts, 2 ♂ ; Cambridge, 1 ♂. All specimens taken in late June and July. I have seen the type of this species.

Microplitis calcarata Thomson
(Text-figs 17, 26)

Microplitis calcarata Thomson, 1895 : 2249.

This species, the type of which I have seen, is easily recognized in the female by the strongly produced hypopygium and the largely fulvous flagellum. Of the five

females I have seen (Finland, 4, England, 1) all have tergite (2+3) reddish yellow and the hind coxa red ; one (England) has tergite 1 red. The males usually have tergite 1 blackened but occasionally it is wholly or in part reddened ; the hind femur is dull red. The wings in both sexes are brownish and the stigma shows hardly a trace of pallor at base. The petiole in both sexes tends to become smoother along the middle line towards apex and here is somewhat greasy-looking.

Inner side of hind femur of female without any kind of modification.

Material examined. FINLAND (both sexes). GERMANY (males). ENGLAND : Hants and Cambridge (males). SWEDEN (males). FRANCE. HOLLAND. Only one British female seen, S. ENGLAND, with stout, unevenly ribbed cocoon.

All specimens taken in May, July and August.

Microplitis fordi sp. n.

♀. Wings virtually hyaline ; stigma more or less evenly dark brown, sometimes very faintly paler at base ; tegula black. Hind femur black ; middle femur black but sharply yellowish on apical quarter ; hind femur predominantly yellow ; at most faintly darkened in apical quarter, above.

Antenna long, rather thick, the preapical segment about one and one third times longer than wide ; flagellum not at all bristly.

Notaulices not or hardly impressed but their course marked by a band of coarser rugosity. Scutellum sculptured all over. Prescutellar fovea markedly bowed, the lateral costae being shorter than the medial ones. Propodeum more or less evenly convex, its reticulate sculpture considerably finer and closer than in the species belonging to the *spinolae-fumipennis* complex. Inner side of the hind femur with distinct ridge.

Tergite 1 about one and two thirds longer than wide, its sculpture on the whole rather fine, slightly narrowed at extreme apex and here with transverse polished swelling rather than a rounded knob.

♂. Sometimes the hind femur faintly flushed with red on inner side.

Length : ♂ ♀, *c.* 3·2 mm.

Type ♀. ENGLAND : Kent, Dartford Heath, ex *Chesias legatella*, emerged 17.vi.1953 from cocoon found 20.v.1953 (*R. L. E. Ford*), BMNH.

Paratypes. Same data as above, 36 ♀, 23 ♂.

Further material. ENGLAND : Surrey, Barnes, 10 ♀, 24 ♂, bred viii.1968 from *Chesias rufata* (*C. Wall*). ENGLAND : no locality, 7 ♀, 2 ♂, bred 29.xii.1892 from *C. oblicuaria* (now *Chesias rufata*). Hants., New Forest, 26.v.1958, 1 ♀ (*J. Clark*). SCOTLAND : Aviemore, 2 ♂, bred viii–ix.1936, ex *Thera juniperata* (*R. L. E. Ford*).

Host : *Chesias legatella* Schiffermüller ; *Chesias rufata* Fabr., on Broom (*Cytisus*). *Thera juniperata* L. (All Geometridae).

The cocoons of the early summer generation are grey, evenly fusiform and without emphasized ribs ; those of the later generation from *rufata* tend to be more pointed at each end and have sharply emphasized, whitish ribs.

I have been much puzzled by a series of specimens in the BMNH bred from *Euclidia mi* Clerck (Plusiidae) from the following localities : ENGLAND : Kent, Sevenoaks, 1 ♀, bred 20.vi.1925. Cambridge, Gog Magog Hills, 1 ♀, bred 8.v.1920, 1 ♂, bred 25.iv.1920 (G. T. Lyle Coll. in BMNH). Lincs, Limber, 1 ♂, 29.iv.1915

(*Cockayne*). Sussex, Hailsham, 10.vi.1953, 1 ♂, (no host !) (*R. L. E. Ford*) ; Eastbourne, 1 ♀, bred 25.v.1915.

All females recorded as having been bred from *Euclidia mi* differ slightly from *fordi* in that the preapical segment of the flagellum is always fully twice as long as wide. The ocelli, too, are placed slightly further from the eye, the distance between a posterior ocellus and the eye-margin being slightly greater than twice the diameter of the posterior ocellus ; in *fordi*, this distance is generally slightly less than twice the diameter of the posterior ocellus.

The cocoons of specimens from *Euclidia mi* are exactly like those of *fordi* from *Chesias rufata*. It is possible that *fordi* parasitizes *Euclidia mi* as well as *Chesias rufata* in late summer, though I do not rule out the possibility that two very closely related species may be involved. I should incline more to this view were it not for certain females of *fordi* bred from *Chesias* that approach very closely these specimens from *Euclidia mi* in respect to the two characters mentioned above.

Lyle, who named the specimens he had from *Euclidia mi* as *viduus* Ruthe (1914 : no page number) states that the parasites spend the winter in the larval state within their cocoon and emerge in April and May. This being so, the host *Chesias legatella* would be available to them.

Males of *Microplitis* are always difficult to identify but I think I have correctly named the two from Scotland. Their having been bred from *Thera juniperata* indicates that there is still much to be clarified concerning the range of hosts of *fordi*.

Microplitis fordi is very close to *viduus*, the main difference being the pubescence of the flagellum of the female.

With regard to coloration, the rather pale yellow hind tibia of *fordi* contrasts sharply with the black femur and is a useful aid towards recognizing the species.

Microplitis sofron sp. n.

A small species, similar in colour to *fordi*, with which it may be compared as follows :—

♀. Antenna rather thin with the preapical segment twice as long as wide. Raised, rugose-reticulations of the posterior part of the mesoscutum more in evidence than in *fordi*. Vannal lobe relatively smaller. Tergite 1 narrower and more obviously narrowed behind.

♂. Like the female and separable from the male of *fordi* virtually only on wing details.

Length : ♂ ♀, *c.* 3 mm.

Type ♀. SWEDEN : Skåne, Löderup, vii.1938 (*D. M. S. & J. F. Perkins*), BMNH.

Further material, paratypes. SWEDEN : Löderup, vii.1938, 2 ♀, 1 ♂. ENGLAND : Kent, Dartford Heath, 1–7.v.1958, 2 ♀, 7 ♂, v.1937. 1 ♂, ex *M. cespitis*, 1.vi.1949, 1 ♂, swept from flowers of *Cytisus*, 1.viii.1937, 1 ♀, with cocoon but no host data (all *R. L. E. Ford*). Hants, near Lyndhurst, 30.v.1955, 1 ♂ (*J. Clark*). ITALY : Laguna Venetia, 1 ♂ (*G. Soika*). SCOTLAND : MP, Duncaves and Ballingling, vii, 2 ♀ ; Aviemore, vi.vii, 1 ♂, 2 ♀ (all *A. W. Stelfox*). IRELAND : Kildare, v, 1 ♂, 1 ♀ ; Westmeath, Riverdale, vi, 1 ♀ ; Antrim, Bushfoot, vi, 1 ♂ (all *A. W. S.*).

Host : *Melanchra* (error for *Tholera* ?) *cespitis* Fabr. on the evidence of a single male. Cocoon pale brown, without obvious ribbing.

This species is characterized by the brightly bicoloured stigma and the obliquely placed radius. A comparison of data reveals that it frequently occurs with *fordi*.

Microplitis strenuus Reinhard

Microgaster gracilis Ruthe, 1860 : 142.
Microplitis strenuus Reinhard, 1880 : 360 (n. n. for *Microgaster gracilis* Ruthe, 1860, *nec* Curtis, 1830).

This species is extremely like *eremita*, differing from it by little more than the characters given in the key. But see discussion under *eremita*.

Material examined. ENGLAND : Cambridge, Fleam Dyke, 20.vii.1955, 1 ♀ (*R. L. E. Ford*) ; Herts, Brickett Wood, 13.vi.1943, 1 ♀, 17.iv.1957, 1 ♂ (*R. B. Benson*) ; Surrey, Dorking, 20.vi.1953, 1 ♂ (*G. J. Kerrich*), Newdigate, 2 ♀, emerged 8.vi.1959, ex *Episema caeruleocephala*, collected 23.v.1959 (*M. Schaffer*). GERMANY : neighbourhood of Berlin, type ♀, in BMNH. SWEDEN : Skåne, Kivik, 18.vii.1938, 1 ♀ (*D. M. S. & J. F. Perkins*). TURKEY : Ankara, 3000 ft, 26.vi.1959, 1 ♀ (*K. M. Guichard*) ; this female has the hind femur extensively infuscate along the dorsal surface.

Host : *Episema caeruleocephala* Linn. (Noctuidae). Cocoon rather small, evenly cylindrical, dark grey with greenish tint and without obvious ribbing ; hardly distinguishable from the cocoon of *fordi* from *Chesias legatella* but a little darker.

Apart from its deceptive resemblance to *eremita*, *strenuus* is characterized by the combination of long thin flagellum and bright reddish yellow tegula. It is less heavily built and less strongly sculptured than the *ruricola-viduus* complex and the wings are much more nearly hyaline.

Microplitis eremita Reinhard
(Text-fig. 23)

Microplitis eremita Reinhard, 1880 : 360.

♂ ♀. Tegula, hind tibia and hind femur bright reddish yellow. Wings almost hyaline ; only the merest trace of a cloud beneath the stigma ; stigma with only the merest trace of pallor at base.

♀. The flagellum is paler beneath with the articulations of the segments showing as faintly darker rings ; in *strenuus* the segments are more uniformly darkened. Fore wing (Text-fig. 23).

Material examined. AUSTRIA : 5 ♂, 2 ♀, all with their cocoon, bred from *Lithocampa ramosa*. One male and one female in BMNH ; rest in Naturhistorisches Museum, Vienna.

Host : *Lithocampa* (now *Callierges*) *ramosa* Esper (Noctuidae). Reinhard records the host as *Dryocampa ramosa*. The moth occurs in Central Europe but is not known from the British Isles. The remarkable cocoon is greyish brown and appears unusually long because of a somewhat flattened, basal pad that forms an extension of the cocoon and by means of which the cocoon is fastened to a twig ; the cocoon proper bears three dark, transverse bands.

The two characters that link *eremita* and *strenuus* are the yellow tegula and the long, thin flagellum. So deceptively alike are the two species that, without their cocoons, I should have regarded them as one.

The seven specimens of *eremita* are all labelled ' Silesia '. Two are dated ' December ' and two ' May ' and from this may be inferred, I think, that the species passes the winter in its very distinctive cocoon. The host-larva, *C. ramosa*, feeds in the autumn. If this host occurred in England, I should not hesitate to put forward the suggestion that a single species is present, spinning a tough, cryptic, winter cocoon (*eremita*) and a simple, unmodified, early summer cocoon (*strenuus*). How *strenuus* passes the winter is not yet known ; that it may parasitize an autumn feeding host related to *Callierges ramosa* and make a cocoon similar to that of *eremita* cannot be ruled out.

Microplitis viduus (Ruthe)
(Text-fig. 19)

Microgaster viduus Ruthe, 1860 : 134.
Microplitis viduus (Ruthe) Reinhard, 1880 : 358.

♀. The type is more than one hundred years old and is somewhat faded. The hind femur is brown but flushed with paler colouring on each side within apical half ; the hind tibia is entirely reddish yellow, without apical infuscation. Stigma evenly brown. Antennae missing.

A bred series that I confidently believe to be this species (England, Bucks, Slough) differs from the type in that the stigma shows a bright yellow patch at base, covering about basal third ; the hind femur is black in all five females and the hind tibia shows weak, apical infuscation.

In five females from the Eastern Mediterranean region (Greece, Cyprus, Palestine), the hind femur varies in colour from that shown by the type to entirely reddish yellow ; these females also have the base of the stigma much more extensively yellow than in the bred series from Slough but they agree with these specimens in the important antennal characters (see key) and (Text-fig. 19).

Material examined. ENGLAND : Bucks, Slough, 5 ♀, bred viii.1939, ex larva of *Hadena serena*, found same month on *Crepis vireus* (*O. W. Richards*) ; Dorset, Wareham, 1 ♀, 27.vii.1954 (*J. Clark*) ; Kent, Bexley, 1 ♀, vii.1945 (*R. L. E. Ford*). GERMANY : neighbourhood of Berlin, type-locality. CYPRUS : iv, 2 ♀. GREECE : Mt. Penteli, v, 2 ♀. PALESTINE : 1 ♀.

Type in BMNH.

Host : *Hadena serena* Fabr. (Noctuidae). Cocoon brown, without ribs or paler, transverse bands ; one of the cocoons is green.

This species is clearly related to *fordi*, from which it differs in being much more heavily sculptured ; this applies particularly to the propodeum, which is much more coarsely reticulate-rugose in *viduus* than in *fordi* ; the structural details of the flagellum are abundantly different in the two species. In coloration and sculpture, *viduus* approaches much more closely to *ruricola* and here again, the only reliable differences are provided by the antenna.

I have found no satisfactory character for separating the male of *viduus* from that of *ruricola*.

Microplitis ruricola Lyle

Microplitis ruricola Lyle, 1918 : 132.

♀. Hind femur sometimes entirely bright reddish yellow ; sometimes darkened at base and apex but apparently never entirely black. Tegula black as in *viduus*. Stigma at most with a very faint, basal spot.

As in *viduus*, the sternaulus in front, where it bends upwards, tends to lose definition, its rugosities merging with the coarse sculpture of the mesopleurum immediately above the front coxa ; in this respect, compare *strenuus*.

Material examined. ENGLAND : Hants, New Forest, type-series, bred from *Anarta myrtilli* (G. T. Lyle Coll. in BMNH). Cambridge. Herts. Kent. Surrey. GERMANY : Freiburg.

Host : *Anarta myrtilli* L. (Noctuidae), host of type-series. *Amphipyra berbera* Rungs (Noctuidae) ; parasites emerged in June and July. *Calophasia lunula* Hufnagel (Noctuidae) in Germany. Of the type-series in the BMNH only the lectotype male has its cocoon ; this is greyish white with faint greenish tint and is similar to the nine cocoons preserved with the series of five females and four males bred from *A. berbera*.

The only difference between this species and *viduus* that I think can be said really to have specific value, lies in the length and vestiture of the apical antennal segments ; all other characters appear to overlap. It can be said, however, that most specimens of *ruricola*, whether male or female, have predominantly reddish yellow hind femora with uniformly dark stigma, while in *viduus*, at least in N. European specimens, the hind femur is black and the stigma shows a conspicuous yellow, basal blotch.

The position is further complicated by the presence in the BMNH of a female bred from *Hadena ochroleuca* Esper (*Eremobia o.*) which has the flagellum, and colour of hind femur as in *ruricola* but a fairly conspicuous yellow spot at the base of the stigma as in *viduus*. There is also in the BMNH a male, bred from the same host, as the female, in July ; this male has the conspicuous pale spot at base of stigma as in *viduus* but the hind femur is predominantly reddish yellow with darkening only at base above.

There is yet another male in the BMNH, bred from *Anepia irregularis* Hufnagel (Noctuidae), clearly conspecific with the above male but with the hind femur darkened at apex as well as at base and a much more conspicuous yellow blotch at base of stigma. These three specimens have the same kind of cocoon as the bred specimens from *Amphypyra berbera* and *Anarta myrtilli*. I am labelling them as *ruricola* in spite of colour gradations towards *viduus*.

Microplitis fumipennis (Ratzeburg)
(Text-fig. 5)

Microgaster fumipennis Ratzeburg, 1852 : 49.
Microplitis fumipennis (Ratzeburg) Reinhard, 1880 : 358.

♂ ♀. Tegula bright reddish yellow ; dark brownish in 2 ♂, 1 ♀, from Switzerland, Valais. Fore wing strongly embrowned ; more so on proximal half than in the related *sordipes*, though, as in that species, with a darker cloud beneath the stigma ; stigma with or without a yellow spot at base. Hind femur reddish yellow ; hind basitarsus, at least on outer side, as reddish over basal half as the tibia.

♀. Middle lobe of the mesoscutum without a medial keel ; at most with a faintly raised line of rugosities. Preapical segment of the flagellum about twice as long as wide. Scutellum tending to become smooth right at middle and here with a few, ill-defined punctures. Sternaulus very coarsely rugose and losing definition in front, its rugosities merging with those of the mesosternum anterior to it. Hind tarsus somewhat tapered towards apex ; outer spur of the hind tibia very slightly longer than the inner one. Rugosity of the second tergite generally very weak, variable and more or less absent in the male.

Length : ♂ ♀, *c.* 4 mm ; one of the largest species.

Material examined. ENGLAND : Lancs, Burnley, 1 ♀, labelled ' ex geo. larva, v.'. IRELAND : 1 ♀, ex *Acronycta rumicis*, found 28.vii.1935, parasite emerged vi.1936 (Stelfox Coll., now in U.S. Nat. Mus.). POLAND : 4 ♀, 9 ♂, bred from *Chamaepora auricoma*, 1 ♀, ex *Acronycta rumicis*. SCOTLAND : Aberdeen, 1 ♂, 1 ♀, bred v., ex *Acronycta menyanthidis*.

Type in BMNH.

Host : With the exception of the specimen from Burnley, this species seems to be confined to the genus *Acronycta* (now *Apatele*) and has been bred from the following species :—*A. rumicis* L., *A. auricoma* Fabr. (=*Chamaepora auricoma*), *A. menyanthidis* Vieweg.

All the Polish specimens bred from *auricoma* are with their cocoons and bear various dates from October to April. These cocoons, like those of the single Irish example from *rumicis* and the Scottish examples from *menyanthidis* are large, greyish brown, with or without two or three indistinct, longitudinal ribs and unusually broadly flattened along the side of attachment. This is certainly the tough, cryptic cocoon in which the parasite passes the winter.

If the adult emerges in late spring or early summer, it presumably makes use of an alternative host before attacking its acronyctid hosts in the late summer and early autumn ; the single female from Burnley, without cocoon, suggests that this alternative host may be found among the Geometridae.

Microplitis ratzeburgi (Ruthe)
(Text-fig. 2)

Microgaster ratzeburgi Ruthe, 1960 : 143.
Microplitis ratzeburgi (Ruthe) Reinhard, 1880 : 359.
Microplitis cerurae Matsumura, 1921 : 52. **Syn. n.**

♂ ♀. This species has tergite 1 much more widened towards apex than *fumipennis* (Text-fig. 2) and tergite 2 much more rugose.

Material examined. JAPAN : Sapporo, 1 ♀, in BMNH, bred from *Cerura lanigera*. GERMANY : Baden, 1 ♂, bred from *Cerura* sp., on poplar (*Populus*) ; Berlin Dist., 1 ♀, (Ruthe Coll., in BMNH.) These three specimens have the tegula dark brown. Type in BMNH.

Host : *Cerura lanigera* Butler, *Cerura* sp. (*Notodontidae*). Cocoon uniformly brown, smoother-looking than that of *fumipennis* and without ribbing ; it is more cylindrical in appearance than that of *fumipennis* and more narrowly attached to the substratum.

Microplitis sordipes (Nees)

Microgaster sordipes Nees, 1834 : 167.
Microplitis sordipes (Nees) Reinhard, 1880 : 359.

♀. A species characterized by the absence of sculpture over the middle part of the scutellum ; this becomes smooth, almost polished and with a few scattered punctures.

Flagellum pale beneath. All the femora and tibiae bright reddish yellow ; front tarsus reddish yellow. Fore wing with a cloud beneath the stigma.

Flagellum rather thick. Middle lobe of the mesoscutum with very weak, longitudinal keel. Sides of the scutellar disc with rugosity that merges very gradually into the strong costae of the lateral area.

Tergite 1 about one and one third times longer than its middle width and evenly rugose.

Material examined. ENGLAND : Bucks, Slough, 1 ♀, from cocoon collected 17.ix.1946 ; adult emerged iv.1947 (*O. W. Richards*). GERMANY. POLAND : 2 ♂♂, bred from *Acronycta rumicis* (*Wiackowski*). FINLAND : Kyarvi, 1 ♀, labelled ' 8.ix.1939, ex larva of *Pygaera pigra* (*Mus. Helsinki*) ; Ta. Sääksmäki, 1 ♀, 21.xi. 1936, ex *Acronycta psi* (*Mus. Helsinki*). CZECHOSLOVAKIA : Junovice, 1 ♀, 17.x. 1950, ex *Pygaera anachoreta* (*M. Capek*) ; BOHEMIA : Praha-Ruzyne, 1 ♀, 25.xi, ex *Acronycta psi* L. (*M. Capek*).

Host : *Acronycta psi* L.; *Acronycta rumicis* L. (Acronyctidae). *Pygaera anachoreta* Fabr.; *Pygaera pigra* Hufnagel (Notodontidae). The larvae of all these moths show a certain degree of hairiness ; this may play an important part in host-selection by the parasite.

Cocoon of very characteristic appearance, rather small, barrel-shaped, grey with brown ends and a brown, medial band ; usually fastened to a thin twig. Being brown-banded, the cocoon bears a superficial resemblance to that of *eremita*.

Although I have seen only seven cocoons of *sordipes*, these were all found in the autumn, with adults emerging the following spring. Their tough texture and cryptic coloration suggest an adaptation to winter conditions.

I provisionally include in my concept of *sordipes* a series of specimens bred during the summer months that make a cocoon entirely different from that of typical *sordipes*. These cocoons are evenly fusiform, thin in texture, pale grey with greenish tint or, more rarely, entirely greenish. The insects emerging from them and which I am unable to separate satisfactorily from *sordipes* I am labelling as ' *sordipes*, summer generation '. The material is as follows :—

CZECHOSLOVAKIA : Holic, 1 ♀, 10.v.1967, ex *Scopelosoma satellitia* (*M. Capek*) ; Banska Stiavnica, 1 ♀, 16.vii–1.viii, ex *Acronycta psi* (*M. Capek*) ; Zap. Nemecke,

1 ♀, 1.viii.1963, ex *Acronycta alni* (*M. Capek*). ENGLAND : Surrey, Godalming, 1 ♂, bred 7.viii.1946 from cocoon found 25.vii.1946 ; Gloucester, Shalford, 1 ♂, bred 3.vii. from Noctuid larva on *Glyceria aquatica* (*O. W. Richards*). FINLAND : Jomala, 1 ♂ (*W. Hellén*). JAPAN : Sapporo, 1 ♀, ex *Porthesia similis* (*C. Watanabe*).

Host : *Acronycta alni* L., *Acronycta psi* L., *Scopelosoma satellitia* L. (now *Eupsilia transversa* L.) ; all Noctuidae. *Porthesia similis* Fuessly (Lymantriidae).

In ascribing two different types of cocoon to *sordipes*, I have taken a course of action that helps me out of a taxonomic difficulty but at the same time finds some support in the available information. Nevertheless, I do not exclude the possibility that I have been unable to separate two closely related species.

Microplitis spinolae (Nees)

Microgaster spinolae Nees, 1934 : 166.
Microplitis spinolae (Nees) Reinhard, 1880 : 358.

♀. Basal half of ventral surface of gaster yellow. Hind femur and hind tibia entirely reddish yellow.

Flagellum long, slightly tapered apically, the preapical segment fully twice as long as wide.

Distribution. N. W. EUROPE and eastwards as far as PERSIA and DAGHESTAN on the material available for examination.

Host unknown.

This species is rather easily recognized by the antennal scrobes above being smooth and polished ; the shining, unsculptured zone sometimes reaches as far as the posterior ocelli. Once appreciated, this feature will alone separate *spinolae* from all the other large species of similar coloration.

Microplitis capeki sp. n.

(Text-figs 8, 9)

♀. In general body form and shape of first tergite extremely like *sordipes*. Fore wing to the naked eye faintly but evenly brownish ; the absence of a dark cloud beneath the stigma makes the fore wing of this species markedly different in appearance from that of *sordipes*. Hind femur and hind tibia entirely red. Flagellum only faintly paler beneath.

In a lateral view of the head, the temple is almost angled (Text-fig. 9), a feature absent in *sordipes*. The polished scutellum is more broadly triangular than in *sordipes* and occupies virtually the whole of the disc ; in *sordipes*, the polished area is more narrowed behind and has a broader area of rugosity along the lateral margin. Tergite 1 not, or only very slightly, widened towards apex (Text-fig. 8).

Length : *c.* 3·8 mm, a little smaller than *sordipes*.

Type ♀. CZECHOSLOVAKIA : Veseli, 13.vi.1954, ex *Hypogymna morio* (leg. *Netopil*), (in coll. Capek).

Paratypes. Three females, same data.

Host : *Hypogymna morio* L. (now *Penthophera morio*) (Lymantriidae). A solitary parasite making a bright grass-green cocoon.

With its long thin antenna, this species is much like *strenuus*, but *strenuus* has a dull, sculptured mesoscutum and scutellum and the first tergite is slightly longer and narrower.

Microplitis xanthopus (Ruthe)
(Text-fig. 28)

Microgaster xanthopus Ruthe, 1860 : 147.
Microplitis xanthopus (Ruthe) Reinhard, 1880 : 358.

♀. Easily recognized on the characters given in the key. The flagellum is rather thick, with the preapical segment about one and a half times longer than wide. The scutellum is dull and strongly rugose all over. The 2nd tergite shows a variable amount of rugosity and in some specimens is almost absent.

♂. In 16 males examined, the sculpture of the mesoscutum is very variable with regard to the degree of rugosity shown on the posterior half ; sometimes the posterior area is deeply impressed and filled with very coarse rugosities ; more rarely, the impression is shallow and rugosities correspondingly weak. The more strongly sculptured males are thus very like those of *fumipennis* but can always be separated from that species by having the hind tarsus more or less entirely yellow and the scutellum more or less evenly rugose ; male *xanthopus* can even more reliably be separated from male *fumipennis* by having the parameres of the genitalia broadly truncate at apex ; in *fumipennis* they are more or less evenly tapered to apex.

Material examined. GERMANY : 1 ♀. IRELAND : 9 ♀, 15 ♂. SWEDEN : 2 ♀, 1 ♂. WALES : 1 ♀.

Host unknown.

Microplitis docilis sp. n.

♀. Legs, except coxae, bright reddish yellow ; hind tarsus weakly infuscate. Scape of antenna bright reddish yellow. Wings faintly darkened ; stigma faintly paler at base. Tergite (2+3) reddish, a little more darkened medially.

Head above, and the temples, very coarsely rugose. Antenna rather thick ; preapical segment fully one and two thirds longer than wide ; pubescence of flagellum conspicuous and somewhat bristly.

Mesoscutum very strongly shining, and, for the size of the insect, unusually strongly rugose ; prescutellar furrow half as long as the scutellar shield itself. Reticulation of the propodeum very coarse and very wide-meshed. Sternaulus very coarsely foveate and hardly differentiated from the rugose sculpture of the mesosternum ventral to it. The distal third of the subcostalis and the edge of the stigma show several, widely spaced but clearly differentiated black bristles.

Tergite 1 very slightly narrowed apically, rugose and about one and a half times longer than wide. Tergite 2, as defined by the weak 2nd suture, with a trace of rugosity on each side of median swollen area. Hypopygium very short, the ovipositor completely concealed.

Length : *c.* 3·2 mm.

Type ♀. Ruokolahti, 17.vi.1948 (*W. Hellén*), Helsinki Museum.

This species is largely characterized by its coarse, glistening sculpture which, with regard to mesoscutum and scutellum, is enhanced to some extent by the relatively sparse pubescence.

REFERENCES

Bouché, P. F. 1834. Naturgeschichte der Insekten, besonders in Hinsicht ihrer ersten Zustände als Larven und Puppen. 216 pp. Berlin.

Lyle, G. T. 1918. Contributions to our knowledge of the British Braconidae. *Entomologist*, **51** : 129–137.

Wesmael, C. 1837. Monographie des Braconides de Belgique. *Nouv. Mém. Acad. R. Sci. Bruxelles* **10** : 68 pp.

All other references will be found in :—

Nixon, G. E. J. 1968. A Revision of the Genus *Microgaster* Latreille (Hymenoptera : Braconidae). *Bull. Br. Mus. nat. Hist.* (Ent.). **22** (2) : 23–72.

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